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2 SHEETS—SHEET 1.

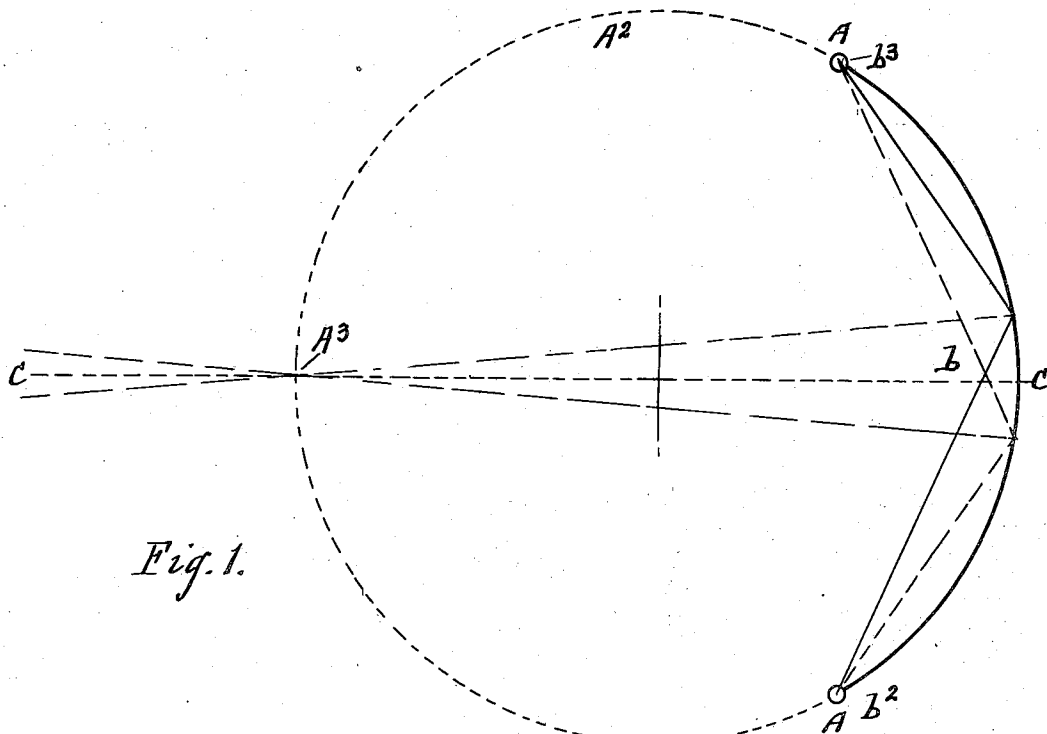


Fig. 1.

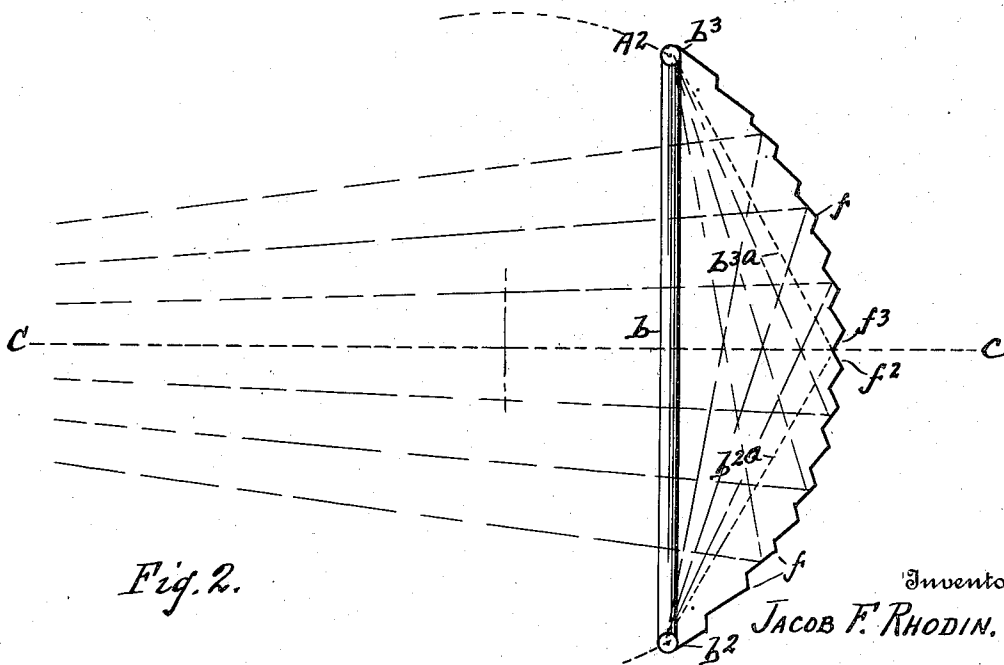


Fig. 2.

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2 SHEETS—SHEET 2.

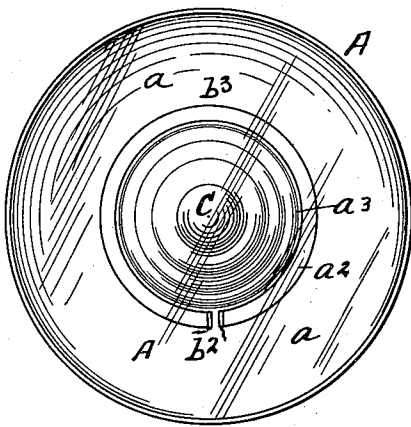


Fig. 3.

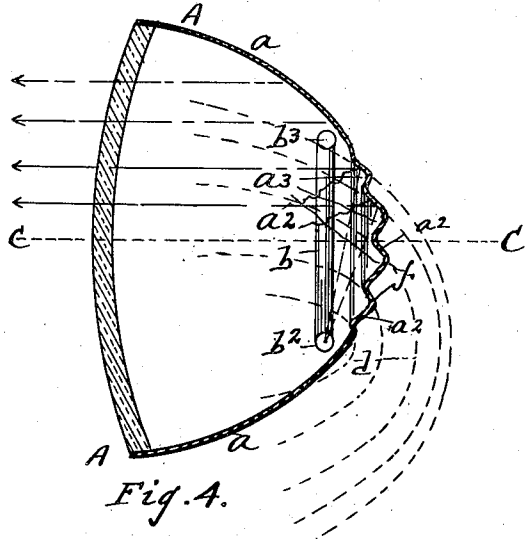


Fig. 4.

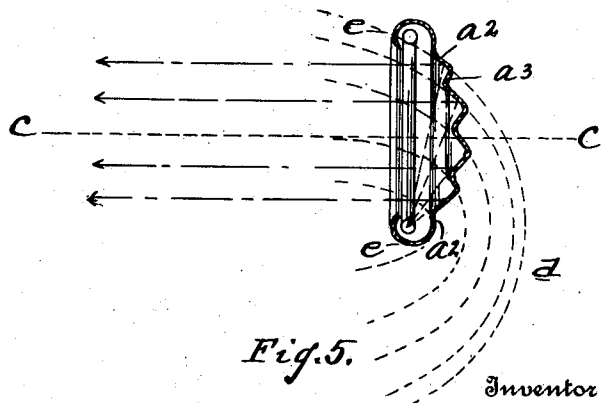


Fig. 5.

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ILLUMINATING APPARATUS.

1,341,674.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, JACOB F. RHODIN, a subject of the King of Sweden, residing at Highland Park, county of Wayne, State of Michigan, have invented a certain new and useful Improvement in Illuminating Apparatus, and declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to illuminating apparatus and an object of my improvements is to provide an apparatus which shall throw a uniform stream of light in the direction required and avoid a glare that has been incident to the use of reflectors with single light-sources, at the same time providing for, in the first place greater concentration when needed, in the second place a milder and more even light than at present obtainable.

I secure this object in the device illustrated in the accompanying drawings in which:

Figure 1 is a diagrammatic view illustrating the construction and operation of an apparatus embodying my invention.

Fig. 2 is a detail sectional view of the reflector shown in Fig. 1 on enlarged scale to illustrate the details of construction of reflectors with focusing rays and a light-dispersing reflector for mild illumination.

Fig. 3 is a front elevation of an apparatus embodying my invention, the construction of the reflector being somewhat modified.

Fig. 4 is a cross-section of the apparatus shown in Fig. 3.

Fig. 5 is a cross-section of an apparatus similar to Fig. 4 showing a partially obscuring screen.

As a general construction my invention contemplates using two sources of light spaced from each other with a symmetrical reflector between said lights symmetrically located with reference to the same. As a further application of my invention I contemplate a number of parts of such lights constituting together a circle or circles of lights with the reflector located within the circle or circles, and such circle may be a continuous strip or body of light such as

would be made by a continuous incandescent filament or the like.

As a further extension of the application of my invention, when strong illumination and great efficiency are desired, I contemplate the extension of said reflector beyond the pair or pairs of sources of light, so that the light radiated outwardly shall be reflected as well as that radiated inwardly.

As a contributory means of obviating the glare, when mild illumination is desired and some degree of efficiency may be sacrificed, I interpose a screen to prevent the direct radiation from the source of light to the field to be illuminated and this screen may be so adjusted or designed as to limit the degree of radiation to the required extent.

In the drawings A designates the reflector as a whole, b^2 and b^3 indicate oppositely located sources of light, preferably 120 degrees apart, which may be oppositely located points of a circular lamp or light b . In Fig. 1 the reflector A between the source of light b^2 and b^3 , in the cross section of the apparatus is one third of a complete circle. A^2 A^2 are construction-lines showing the continuation of the circle of which the section of the reflector is a part.

With this construction the distributing of the light on the reflector between the sources of light b^2 and b^3 will be uniform, because at a point of said reflector near one of said sources of light the light will be stronger from the nearer source and will be proportionally weaker from the farther source. Upon any point of the circle A^2 such as A^3 the effect of the light upon an observer will be uniform inasmuch as the same surface of said reflector will subtend the same solid angle from any point on said circle. Of course, this will be approximately the truth in the region adjacent to the circle A^2 .

My invention contemplates forming the surface of the reflector between the sources of light b^2 and b^3 into a series of facets f as shown in Fig. 2. These facets are formed in the following described way: If two rays of light, one b^{2a} proceeding from the source b^2 and the other b^{3a} proceeding from the source b^3 and intersecting at a point on the surface of the reflector in a plane through the axis $c-c$, and forming an angle of 120 degrees are conceived of, and a generatrix is taken consisting of a short extension of

each of the rays beyond the point of intersection, and these two generatrices as well as the two lights b^2 and b^3 are moved along some parallel directrices such as coaxial circles (Fig. 2) or parallel straight lines (Fig. 6) the generatrices will then form the constituent side surfaces f^2 and f^3 of the facets f .

With this construction in each generating plane, the angle between the rays striking one point on the circle, will be at all times 120 degrees. It will be noted that no light from the source b^2 will be reflected by the surface f^3 , but all the light from source b^3 will be reflected from the surface f^3 of each of the facets to point a^3 on the circle, where the axis of the reflector intersects same. And all the light from source b^2 will be similarly reflected and focused as well. It is evident from the construction that all the said facets are parts of two groups of ellipses, the foci of which are b^2 and b^3 as radiating points and a^3 as point of reflection common for both groups of ellipses.

The above is the general construction for reflectors with focusing rays, the facets being mirrors and the field of illumination thus strictly determined.

When the apparatus is a head-light. I contemplate giving the main curve of the reflector in the cross-section the shape of a parabola circumscribing an isosceles triangle with 120 degrees center-angle; when it is a lamp over a work bench for instance, I contemplate an elliptic curve circumscribing said triangle. The said curves approach the said circular arc very closely within the said limit of 120 degrees center-angle, all possible ellipses through the three points of the triangle being confined between the circle and the parabola. The parabolic construction is illustrated in Figs. 3 and 4, the elliptic construction in Figs. 5 and 6.

Referring to Figs. 3 and 4, a represents the reflector extending outward from the source of light b . This is a surface formed by a part of a parabola having its focal point at a point b^2 in the plane of the cross-section and at the opposite side of said light and being rotated around the axis c .

Radially within the circular light or lamp I form a series of facets corresponding to the facets of Fig. 2, which in this case have their reflecting surfaces indicated by the reference character a^2 and a^3 to indicate that they are a continuation of the reflector a . In this case each of these reflecting surfaces is a small part of a parabola in cross section, the parabolas being indicated by d and having their foci at b^2 . The surfaces a^2 of the facets f are formed by the revolution of these short sections of parabolas about the axis c . The reflecting surfaces a^3 are similarly formed by the revolution of parts of parabolas having their foci at b^3 .

In Fig. 5 I have shown a screen e interposed to prevent the direct radiation of the lamp near the field of illumination. This screen permits of the light radiating to the reflecting surfaces a^2 and a^3 . The interior surface of screen e I intend to make light-reflecting in such a way as to secure the greatest possible radiation of light to the visible reflecting surface a .

Returning to Fig. 2 it is evident from the above given demonstration that the way the circular arc is illuminated from the acute corners of the inscribed 120 degrees of isosceles triangle makes it a most favorable distributor of light from these points, and if given a light dispersing surface such as that of dull silver, will form a luminous surface when so illuminated. For a circle, the point of highest illumination is in A^3 for an ellipse farther out in the direction of the axle, and for a parabola the light expended will proceed parallel outward, evenly distributed from b^2 to b^3 at right angles to its direction. Under one of these forms with the direct light rays screened from the front, I contemplate using this application for interior lighting when mild and even light is desired.

What I claim is:

1. In a head light, the combination of a circular light-source and a reflector consisting in a concave part outside the circle reflecting the light directly forward and a concave part inside the circle also reflecting the light directly forward, said light source being closely adjacent to the reflecting surface, the reflecting surface within said light source being continuous and free from obstruction.

2. In a head light having an axis, a circular light source, said source having the center of its circle in said axis and the plane thereof at right angles to the same, and a reflector which has a bowl-shaped surface formed by a generating curve revolved around said axis, said curve being made up of parts, which alternately face one point of the light source in the cross section at the same time being tangential to the diametrically opposite point, and alternately are tangential to the first point and face the other.

3. In a head light having an axis, a circular light source, said source having the center of its circle in said axis and the plane thereof at right angles to the same, and a bowl-shaped reflector having one portion outside the light source which is an unbroken reflecting surface of rotation of a part of an conic section as generatrix, and one inner portion back of the plane of the light source created by the revolution of a plurality of parts of curves alternately facing and tangential to one point of the circle in the cross section.

4. In a headlight having an axis, a light

source disposed along a line around the said axis, in a plane at right angles to the same and a bowl-shaped reflector around and back of said light source made up of rings parallel to said line, each of the intersections of said rings by planes through the axis alternately facing points of intersection of said line by said plane upon the opposite sides of said axis, said rings reflecting forward the light rays.

In testimony whereof, I sign this specification.

JACOB F. RHODIN.